



The significance of nuclear power for reducing the carbon dioxide emissions

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In the recent IPCC climate report it is stated that a substantial portion of the increase of global temperature and other climate changes are very likely anthropogenic. An important component in the global energy mix is electrical energy which is mainly produced by fossil fuels, coal, oil and gas. These fuels provide the base load, power which must always be available. During 2011, the global electrical energy was produced to 68 % from fossil fuels, 16 % from hydropower, 12 % from nuclear power and to a few per cent from renewables, in total 22 126 TWh according to the International Energy Agency.

To reduce the carbon dioxide emissions and avoid negative climate effects, fossil-free energy will be required. Electrical energy from fossil fuels must be phased out unless large-scale storage will become a reality.

A portion of the fossil electrical energy can be replaced by intermittent solar and wind power but also by nuclear energy as a base load provider.

According to the report "Prevented Mortality and Greenhouse Gas Emissions from Historical and Projected Nuclear Power" by Pushker A. Kaharecha och James E. Hansen, recently published in American Chemical Society's journal Environmental Science and Technology, nuclear power has contributed to a reduction of the global annual emissions of carbon dioxide by 2 600 million tons (Mton) compared to a hypothetical situation where the electrical energy had instead been produced by fossil fuels.

In Sweden, nuclear electricity has contributed significantly to reduce the dependence on fossil fuels, in particular oil. In 1970, the fossil fuels provided 80 % of Sweden's energy supply to be compared with the current figure 32 %. During the last 42 years the Swedish carbon dioxide emissions have decreased from 100 Mton to 49 Mton. The major reason for this improvement is the build of 12 nuclear reactors in the period 1970 to 1985. If the nuclear base-load power were to be replaced by fossil power, the carbon dioxide emissions will increase between 50 and 100 % depending on if gas or coal would be the alternatives; with coal power as the alternative, the Swedish carbon dioxide emissions would increase to the 1970 level.

Sweden's power production is practically fossil-free, primarily due to the big shares of hydro and nuclear power. During 2012, according statistics from Svensk Energi, the supply of electrical energy was 162 TWh; hydropower 78 TWh, nuclear power 61,4 TWh, CHP 15,5 TWh and wind power 7,2 TWh. The fossil share of CHP was 5 TWh. Thus Sweden's power mix consists only of a few per cent fossil power. Among European countries, only Norway with its 95 % hydropower has a better situation than Sweden. It should be pointed out however that the nuclear power accounts for the major portion of the Swedish base-load power and therefore it contributes to the low carbon dioxide emissions in Sweden.

This report has been compiled by the Energy Committee's working group consisting of: Lennart Bengtsson, Harry Frank, Dick Hedberg, Sven Kullander och Elisabeth Rachlew

Sweden's total Mton carbon dioxide emissions, TWh nuclear power, % fossil fuels

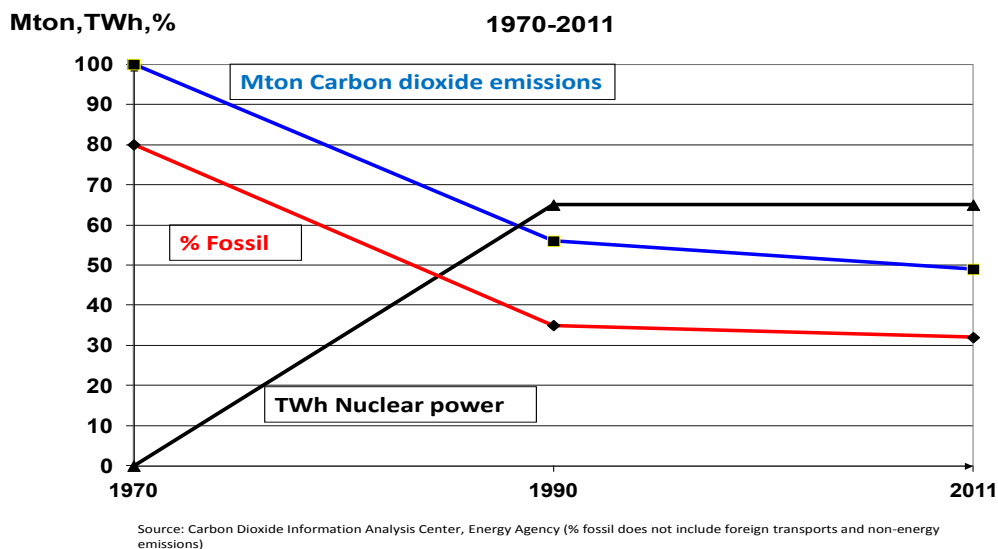


Figure 1. The share of fossil-fuel energy supply is seen to drop from 80 % in 1970 to slightly more than 30 % in 1990 in coincident with the building up of nuclear power. During the same period, the carbon dioxide emissions drop from 100 to 49 Mtons.

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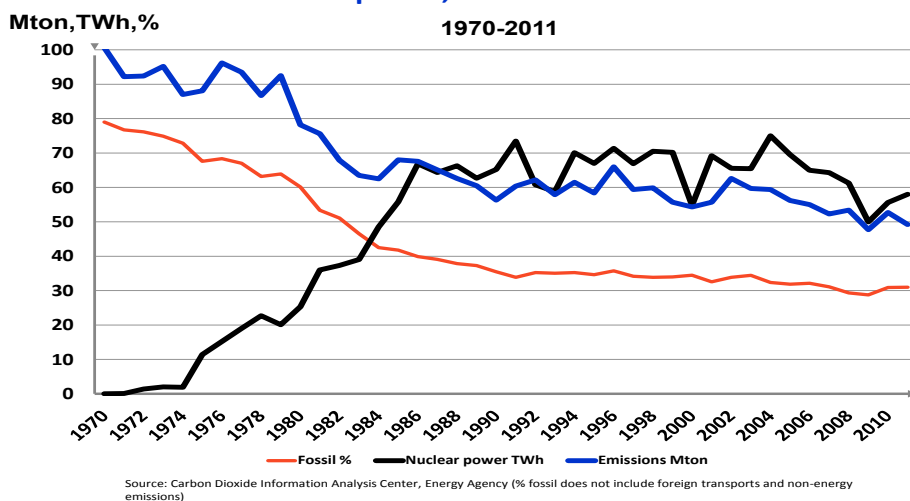


Figure 2. Annual statistics for the years 1979–2011.



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